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A Theory of Common Dealing with the Internet as an Innovative Distribution Channel

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Abstract

After the emergence of the Internet, an interesting question arises that what is its impact on the firms' channel and pricing strategies. This paper applies game theory to study the strategic interactions between rational manufacturers, retailers, and consumers, and it generates the following results: 1. The presence of the Internet allows imperfectly competitive manufacturers to better coordinate their pricing, targeting, and channel strategies, thereby minimizing the agency costs involved in common dealing at the traditional outlets, which in turn enhances the manufacturers' profits. 2. Exclusive dealing may and may not become more prevalent in the presence of the Internet. It all depends on the ratio of the population of switchers to the entire population of consumers. 3. The presence of the Internet allows a monopolistic manufacturer to screen consumers by serving different people at different outlets. Screening is less effective, however, in the case of imperfect competition. 4. A dynamic adjustment process is obtained which describes how a manufacturer should optimally change his channel and pricing strategies when the population of the Internet purchasers grows over time.

1. Introduction

The prevalence of the Internet brings a great deal of business opportunities and potential markets. For one thing, manufacturers do not have to rely on retailers to sell their products to final consumers. Through the Internet, they can directly contact worldwide consumers and have better understanding about what consumers want and need. Similarly, retailers can also serve consumers that they could not have reached otherwise. However, by making searching easier for consumers, the Internet is said to intensify price competition. For example, Bakos [1] suggests that lower search cost on the Internet would lead to more severe price competition and lower profits. Brynjolfsson and Smith [2] show empirically that the price competition on the Internet is sharper than that in traditional channels for standard products like CD and books. However, some scholars have opposite views and think that a low search cost will not necessarily intensify price competition. For example, Lal and Sarvary [3] point out that for non-digital products under some conditions, consumers who search in the absence of the Internet may shop their familiar brands on the Internet without searching. Therefore, it is possible that the presence of the Internet not only enhances the consumer loyalty but also eases the price competition between firms.

Before the emergence of the Internet, manufacturers could only sell their products to consumers in the traditional channels. If the channel is not vertically integrated, manufacturers have to contact consumers through retailers. In general, a manufacturer hopes that retailers can provide various in-store promotions for its product to increase its sales volume, including in-store advertisement, displaying its product, or even persuading consumers to switch to the manufacturer's brand on the point of purchase. However, the retailer who maximizes the profits from its assortments would promote the brand with the highest profit margin. In fact, the retailer may even use the leading brand with a lower margin to build traffic while persuade consumers to buy another high-margin brand on the point of purchase. To solve the incentive problems, the manufacturer could choose exclusive dealing [5]. Exclusive dealing is a contractual arrangement between a manufacturer and its dealers where the latter agree not to carry brands competing with the manufacturer's brand In contrast, under common agency, manufacturers allow their dealers to carry brands competing with their own. One stream of previous literature centers on how the channel structures, in particular, exclusive dealing or common retailer, chosen by competing manufacturers affect the intensity of competition among manufacturers. Mathewson and Winter [6] argue that the retailer would not accept exclusive dealing offered by a manufacturer unless the associated wholesale price is low enough, which implies intensive potential competition between manufacturers in order to be selected as the only brand carried by the retailer. Others argue that under exclusive dealing, the perceived demands of manufacturers are more inelastic than under common dealership, thus softening the upstream competition [4] [8]. It happens because under exclusive dealing a manufacturer knows that the decrease in its wholesale price will result in not only the decrease in its own retail price but also the retail price of a competitive product set by the other exclusive dealer. In addition to the associated intensity of competition, cost is another concern when manufacturers consider whether to impose exclusive dealing or not. When manufacturers sell

products through a retailer, they would incur a setup cost. Under common agency, manufacturers could share the setup cost, thus having a positive externality compared with exclusive dealing.

The emergence of the Internet channel may give manufacturers a way to overcome a retailer's incentive problems. The Internet channel differs from traditional channels in two important ways. First, on the Internet it is consumers that decide what information to search and to retrieve. Therefore, online retailers can not influence/change consumers' brand preferences as much as traditional retailers. Second, the Internet channel can not reach consumers who do not have access to the Internet. Manufacturers when designing their optimal channel strategies must take into account the distinctive properties of the traditional channel and the Internet channel into account.

The purpose of this paper is twofold. First, we analyze how the presence of the Internet may help manufacturers alleviate a traditional retailer's incentive problems. Second, we characterize imperfectly competitive manufacturers' equilibrium channel strategies in the presence of the Internet.

To achieve the above two objectives, we consider a model with two manufacturers and two traditional retailers. For each manufacturer's brand, there are two kinds of customers, loyals and switchers. The segment of loyals have higher reservation price for the manufacturer's brand and will not be influenced by traditional retailers on the point of sales. In contrast, the segment of switchers have lower reservation price and can be persuaded by traditional retailers to buy the competing brand. Before the emergence of the Internet, a manufacturer marketing strategy crucially depends on two factors. The concern for double marginalization, which determines the segments that manufacturers want to serve and the retailer's persuasion power affects the choice of exclusive dealing or common agency. After the emergence of the Internet, the consumer market is redefined according to whether consumers have access to the Internet. Thus the proportion of consumers using Internet and the difference in cost between traditional channel and Internet channel would also affect the manufacturers' channel design and the targeting decisions in different channels. This paper applies game theory to study the strategic interactions between rational manufacturers, retailers, and consumers, and it generates the following results:

1. The presence of the Internet allows imperfectly competitive manufacturers to better coordinate their pricing, targeting, and channel strategies, thereby minimizing the agency costs involved in common dealing at the traditional outlets, which in turn enhances the manufacturers' profits.
2. Exclusive dealing may and may not become more prevalent in the presence of the Internet. It all depends on the ratio of the population of switchers to the entire population of consumers.
3. The presence of the Internet allows a monopolistic manufacturer to screen consumers by serving different people at different outlets. Screening is less effective, however, in the case of imperfect competition, a dynamic adjustment process is obtained which describes how a manufacturer should optimally change his channel and pricing strategies when the population of the Internet purchasers grows over time.

2. Literature Review

One of The issues that attract many researchers' attention after the prevalence of the Internet is how the Internet affects the intensity of competition among firms. Although some scholars (eg, Lal and Sarvary, 1999) argue that the non-digital attributes of products may influence consumer behavior, which are decided by the concern of extra transaction cost, and cause the favor of existing brand. According to this argue, the firm will face better pricing condition. Nevertheless, most people agree that the development of the Internet has reduced searching cost and made consumers get information easily, which will lead price competition and sharply reduce price level. Brynjolfsson and Smith (2000) have empirically studied the price competition in two categories - CD and books – to exam whether the price competition on Internet would be more severe than the traditional channel. CD and books are both highly homogeneous products, which means that the product quality will not vary within different channels. The result shows that the product prices on web are lower than on brick, which means that pricing wars are more intensely on virtual world. Besides, the shift scale of price on web store is 1% of it on physical store, which means that the Internet trades possess lower menu cost and are more sensitive on price. Interestingly, the price dispersion among web retailer is larger than which among conventional retailer, and the leading firms in CD and books market are not the one who marked the lowest price. Firms adopt low price strategy shared few market value, which means purchasing cost is not the only concern of buying decisions even there are homogenous products. The degree of trust in website, brand, and service are important to buying decisions. Consequently, the homogenous products may not necessarily lead to competition on price on virtual channel.

Exclusive dealing is a commitment between manufacturer and retailer thatretailers agree not to carry the competing brands. That means a manufacturer requires its retailers only to sellits products. The issues of exclusive dealing in the past researches can be categorized into three types: one is the impact of exclusive dealing to social welfare; two is the equilibrium channel structure, including exclusive dealing, common dealing, and vertical integration; three is how other marketing variables, like price and promotion, change under different channel structure.

O'Brien and Shaffer (1993) correct Lin's (1990) error and argue that manufacturers eventually choose exclusive dealing as its channel structure among exclusive dealing, common dealing and vertical integration. In their setting, the competition at retail level is monopoly and duopoly under common agency and exclusive dealing respectively. For this reason, common agency gives the retailer the power to threat manufacturers to sell only one products. Therefore, manufacturers could not extract all profits under common agency but could under exclusive dealing. In addition, manufacturers can alleviate competition through retailers, thus it is optimal for manufacturers to choose exclusive dealing. It is worthy to notice that the retailer's pricing strategy with common agency is like product line pricing, so the consumer surplus will be extracted at most. Compared to exclusive dealing, consumer surplus under common agency is even lower.

Many studies do not consider vertical integration, and they only focus on the manufacturers' choice between exclusive dealing and common agency. Bernheim and Whinston (1985) model the retail competition as perfect competition and the retail prices are set by manufacturers. It results the manufacturer would delegate some marketing decisions to common agency in order to collude with each other. That is because common agency provides an indirect mechanism through which competing manufacturers may "sell out" to a single retailer, thereby creating incentives which generate a collusive outcome. It is worth to note that the results critically depend on that the manufacturer has the power to set retail price.

Besides Bernheim and Whinston, Besanko and Perry (1993) also model perfect competition at retail level. They continue Marvel's (1982) study on free-rider problem. Marvel indicates that a manufacturer can solve the free-rider problem through exclusive dealing. For a leading brand manufacturer, it must invest much money on advertisements to let consumers aware its brand and purchase in advance. When consumers come to the retailer's outlet, they may be attracted by other competing brands because of the low prices, thus a strange phenomenon that the manufacturer invests but increases the competitor's sales arises. After the leading manufacturer chooses exclusive dealing, the incentive problem disappears and the benefits of advertisements are surely owned by the manufacturer itself.

Besanko and Perry transform the free-rider problem into interbrand externality. Interbrand externality is that when manufacturers are common agency, the benefits of their investments are shared with each other, and hence the effect is two-sided not one-sided like Marvel's. Their study explores that manufacturers would use exclusive dealing if the costs of investment were not too high. Because a manufacturer possesses whole benefits of the investment, it induces to spend more money on advertisements and the competition is thus more intensive. The results in O'Brien and Shaffer or Bernheim and Whinston implicate that the channel structure in the market is unique, but Besanko and Perry allow different equilibrium under different conditions, and it is closer to the real world. They also prove that exclusive dealing could maximize the social welfare under and thereby it is not right to forbid exclusive dealing from the view of social welfare.

Mathewson and Winter (1987) considers a asymmetric market, where manufacturers have different marginal production cost and the retailer is a monopoly. Because the retailer is monopoly, manufacturers have to compete on wholesale price if they want to impose exclusive dealing. They argue that when the cost has big difference, the dominant manufacturer, with lower marginal cost, could guarantee itself the market by imposing exclusive dealing without its wholesale price declining too much. Thus, the equilibrium is exclusive dealing. Obviously, Mathewson and Winter also allow different channel equilibrium in different marketing environment.

Lal and Villas-Boas (1996) consider a more general model, where manufacturers and retailers are all duopoly. In their model, the situation that one retailer distributes one product and the other retailer distributes both products may arise, so the intrabrand competition is under consideration. They argue that if the retailer-loyal segment is not too large, manufacturers both choose common agency. That is because if the retailer-loyal segment is too large, it provide higher incentive to decrease wholesale price.

There are three contributions in our study. First, we introduce multiple marketing channel in discussing exclusive dealing and common agency. Because retailers have different marketing power and consumers have different ability to access the Internet in different channel, it gives manufacturers a chance to screen by channels. The idea is that manufacturers should induce different segments to shop in different channels. When the consumer structure in a channel is more homogenous, the competition between manufacturers decreases and it leads them to be more profitable. Second, given the level of externality, the equilibrium is not thus unique. In Besanko and Perry's (1993) study, they use the share of investment to express externality, and once the level of externality is given, we could know the equilibrium channel structure. In our study, we use the setup cost to express the externality, and even the level of externality is high, manufacturers may not choose common agency eventually. That is because we consider the retailer's ability of persuasion. Because a retailer could persuade consumers to purchase some brands, manufacturers would lower wholesale price to induce the retailer to persuade for him, and it leads to intensive competition under common agency. By using the characteristic that retailers have different persuasion power in different channel, we can

show that the level of externality is not enough to decide the equilibrium. Third, the discussions about the preferences of exclusive dealing or common dealing are short of consideration of the cost difference. It implies that the cost of two kinds of dealing is the same (Lin, 1990; O'Brien & Shaffer, 1993). Marvel (1982) and Besanko & Perry (1993) take the advertisement cost into account. Although the exclusive dealing will raise the manufacturers' investment on advertisement and common dealing will ease off such competition for the reason of external effect, they also assume that the advertising costs are indifferent between exclusive dealing and common dealing. Our study argues that the establishments of each retail outlet will have a fixed cost. It can be shared if manufactures choose common dealing but not for the exclusive dealings case. It means that manufactures should consider the different costs between exclusive dealing and common dealing.

3. Model

In the market, there are two manufactures, manufacturer 1 and manufacturer 2, producing brand 1 and brand 2, respectively. In this article, we sometimes use N_1 and N_2 to represent manufacturer 1 and manufacturer 2. Assume the production cost is 0 for both manufacturers without loss of generality. The population of consumers is normalized to 1, including 4 segments: (1) Segment G_1: it consists of consumers who are loyal to brand 1 and have their reservation prices for brand 1 and brand 2 equal to H and 0, respectively. The proportion of this segment is (1-q)/2. (2) Segment B_1: it consists of consumers who are the switchers of brand 1 and have their reservation prices for brand 1 and brand 2 equal to M and L, respectively. The proportion of this segment is q/2. (3) Segment G_2: it consists of consumers who are loyal to brand 2 and have their reservation prices for brand 1 and brand 2 equal to 0 and H, respectively. The proportion of this segment is (1-q)/2. (4) Segment B_2: it consists of consumers who are the switchers of brand 2 and have their reservation prices for brand 1 and brand 2 equal to L and M, respectively. The proportion of this segment is q/2. Let $H > M > L > 0$ and $0 \leqq q \leqq 1$.

From the discussion in section 2, we know the competition among online retailers on the net is more intensive than the traditional channel in general. Thus, we assume there are two retailers R_1, R_2 in the traditional channel, but there are many potential retailers on the Internet. Especially, only the retailers in the traditional channels have the ability to persuade consumers and change their preferences. A retailer can persuade consumers in B_1 or B_2 to buy their less preferred brand by incurring a persuasion cost C and raising their reservation price for their less preferred brand from L to M. in contrast, consumers in G_1 and G_2 can not be influenced by the retailer's persuasion effort. To highlight the importance of persuasion power of retailers at the traditional channels, we let L=0.After emergence of the Internet, a part of consumers have the ability to shop on the net. Let α_G and α_B be the proportions of the Internet users in the segment of loyals and in the segment of switchers, respectively.

The sequence of the game can be described as follows. First, the two manufacturers simultaneously decide which distribution channel(s) to use. Then they simultaneously choose only one retailer to sell their product for each chosen distribution channel. Then the contacted retailers accept or reject manufacturers' offers. Whenever the two manufacturers choose the same retailer to distribute their products, the common dealership occurs; otherwise, manufacturers adopt exclusive dealing. Then manufacturers set their wholesale prices and given the wholesale prices retailers set their retail prices. l[1] As for the Internet channel, since there are many potential online retailers who will offer attractive contract in order to obtain the dealership from manufacturers. As a result, the retailer who gets the dealing right can not charge any retail price higher than its marginal price.

Denote the cost of setting up a retail outlet in the traditional channel by K_T and on the Internet be K_E. R_1 and R_2 set retail prices P_1, P_2 given the wholesale prices w_1 and w_2, and decide whether to influence a consumer's purchase decision by incurring a persuasion cost C. Besides, online retailers persuade consumers, which implies that the persuasion cost on Internet is assumed to be infinite.

Before shopping, consumers know the selling prices and their reservation prices of the two brands, and they seek to maximize their consumer surplus when choosing the product to buy. Consumers make their brand choice on the point of sales, which may be influenced by the retailer they shop at. To focus on the impact of the Internet on manufacturers' channel strategies, we deliberately abstract from the effect of consumer's differing preferences towards different distribution channels by assuming that the shopping cost of consumers at traditional channels is the same as on the Net and is equal to 0.

In what follows we use (X^i,Y^j) to denote an equilibrium where X-type consumers are served in the traditional channel and Y-type consumers are served on the Internet and i (j) indicates the type of dealership adopted in the traditional channel (Internet channel , respectively), either exclusive dealing (denoted by E) or common dealing (denoted by C).

The game proceeds as follow:

1. *N_1, N_2 choose exclusive dealing or common dealing.*
2. *After the determination of channel structure, N_1, N_2 set wholesale price w_1, w_2.*
3. *R_1, R_2 set retail price P_1, P_2.*
4. *Consumers choose shopping channel*

[1] This formulation is similar to that of Lin [4] and O'Brien & Shaffer [8.]

5. *The retailer chooses whether to persuade.*
6. *Consumers choose brand.*

Before the emergence of Internet

Before the emergence of the Internet, the manufactures have to decide whether to distribute their product through the same retailer (i.e., common dealing) or different retailers (i.e., exclusive dealing), and which segments of consumers to target. Through exclusive dealing, manufactures are able to avoid the intensive price competition resulting from the retailer's incentive problem. Through common dealing, manufacturers can share the setup cost. Since manufactures are symmetric in every aspect, the equilibrium is also symmetric. The four possible equilibria are as follows:

1. *Equilibrium (G^C,0):* Both manufacturers only serve their respective loyals through a common retailer ($N_1\rightarrow(G_1,0)$；$N_2\rightarrow(G_2,0)$).

In equilibrium, the wholesale prices are set at the loyals' reservation price H, and so are the retail prices. In the equilibrium, the loyals' consumer surplus is completely extracted as in the monopoly case. The total channel profits are accrued to the manufacture and equal to $\pi_1^M = \pi_2^M = (1-q)H/2 - K_T/2$.

2. *Equilibrium (A^C,0):* Both manufacturers serve all consumers in their respective markets through the common retailer ($N_1\rightarrow(G_1+B_1,0)$；$N_2\rightarrow(G_2+B_2,0)$).

First note that in order to induce the retailer to serve all consumers in manufacturers' respective market by setting the retail price at M, manufacturers would set their wholesale prices satisfying $(M-w)/2 \geq (1-q)(H-w)/2$. The condition ensures that the retailer obtains higher profits when serving each manufacturer's switchers than otherwise. When this is the equilibrium, $w_1 = w_2 = [M-(1-q)H]/q$.

Now we need identify the condition under which it is not profitable for each manufacturer to attract its rival's switchers by lowering its wholesale price and thus sustain the above equilibrium. To this end, we shall first derive the wholesale price that induces the retailer to switch consumers for the deviating manufacturer and then show that the resulting manufacturer profit is lower than staying in the equilibrium. When one manufacturer, say N_1, deviates by lowering w_1, the condition, $(1+q)(M-W_1)/2 + (1-q)[M-(M-(1-q)H)/q]/2 - C \geq (M-W_1)/2 + [M-(M-(1-q)H/q]/2$, must be satisfied in order to induce the retailer to incur a cost C and persuade manufacturer 2's switchers to buy brand 1. Thus manufacturer 1 has to lower his wholesale price until $w_1 = [M-(1-q)H-2C]/q$ in order to induce the retailer to switch his rival's consumers to buy brand 1. Finally, manufacturer 1 would prefer staying in the equilibrium to deviating if the condition, $[M-(1-q)H]/2q \geq (1+q)[M-(1-q)H-2C]/2q$, holds. Simplifying the above inequality gives us:

$$C \geq [qM - q(1-q)H]/2(1+q)$$

By (3-1), when the persuasion cost is high enough, both manufacturers will be content with their own customers, making it possible to sustain the equilibrium (A^C,0), the manufacturer's profits in this equilibrium are $\pi_1^M = \pi_2^M = M-(1-q)H/2q - K_T/2$. When condition (3-1) does not hold, once the manufacturers choose the same retailer, they will compete with each other on the basis of the wholesale prices to obtain the retailer's support, as will be shown in the fourth possible equilibrium.

3. *Equilibrium (A^E,0):* Both manufacturers serve all consumers in their respective markets through their own exclusive retailer ($N_1\rightarrow(G_1+B_1,0)$；$N_2\rightarrow(G_2+B_2,0)$)

When each manufacturer serves consumers through their exclusive retailer, he does not need to worry about the retailer's persuasion power. Therefore, his pricing strategy is the same as in the monopoly case with the wholesale price equal to $w_1 = w_2 = [M-(1-q)H]/q$.

4. *Mixed strategy equilibrium:* both manufacturers mixed pricing strategy through common dealing

When (3-1) does not hold, for example, when the proportion of switchers (q) is high or/and the persuasion cost is low enough neither manufacturer will content himself with serving his own customers. Each manufacturer would like to attract his rival's switchers through the retailer's persuasion power by offering a more attractive wholesale price to the retailer, thus resulting in a severe price competition between manufacturers. On the other hand, each manufacturer can guarantee a marginal profit $(1-q)H/2$ by serving his own loyals only. Thus the manufacturer will not cut his price lower than $(1-q)H/(1+q)$ to attract his rival's switchers for in the latter case the resulting manufacturer profits $[(1-q)H/(1+q)]*(1+q)/2$ are lower than in the former case. In fact, in the same spirit of Varian [9] and Narasimhan [7], there exists only the mixed strategy equilibrium where each manufacturer randomizes his wholesale price according to a distribution function. The manufacturer whose wholesale price turns out to be more attractive would succeed in obtaining the retailer's support in attracting his rival's customers for him. In this mixed strategy equilibrium, the expected profits for each manufacturer are $\pi_1^M = \pi_2^M = (1-q)H/2 - K_T/2$, the same as the manufacturer would obtain by serving his loyals only.

Proposition 1: Let the reservation price of the loyals' be 1 and that of the switchers' be k ($0 \leqq k \leqq 1$). Suppose that the setup cost in the traditional channel is the same as on the Internet, i.e. $K_T = K_E = K$.

Before the emergence of the Internet, the respective conditions for each equilibrium to occur are as follows:

Equilibrium	Equilibrium conditions
$(G^C,0)$	$k \le 1-q^2$
$(A^C,0)$	$k \ge 1-q^2;$ $k \le [q(1-q)+2(1+q)C]/q$
$(A^E,0)$	$k \ge 1-q^2+Kq;$ $k \ge [q(1-q)+2(1+q)C]/q$
Mixed strategy equilibrium	$1-q^2 \le k \le 1-q^2+Kq;$ $k \ge [q(1-q)+2(1+q)C]/q$

Table 1 The equilibrium conditions before the emergence of the Internet

The conditions above are derived from the following logic. To sustain equilibrium, the equilibrium profits have to be larger than any other profits that are derived from other possible strategies. Take equilibrium (A^C,0) as an example. When manufacturers are in this equilibrium, they have no incentives to serve their respective loyals and to induce the retailer to persuade consumers to buy his brand. The former condition is equal to satisfy $k \ge 1-q^2$, and the later condition is equal to satisfy $k \le [q(1-q)+2(1+q)C]/q$. As a result, the two inequalities are the conditions to sustain equilibrium (A^C,0). We can infer other equilibrium conditions by the same logic.

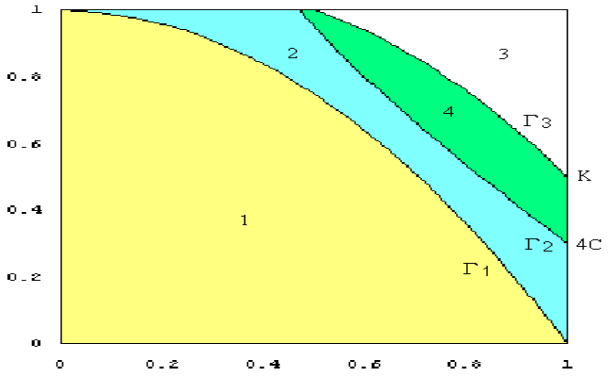


Figure 1 The equilibriums before the emergence of the Internet

Note:
1: Equilibrium (G^C,0); 2: Equilibrium (A^C,0);
3: Equilibrium (A^E,0); 4: Mixed Equilibrium
Γ_1: $k = 1-q^2$
Γ_2: $k = [q(1-q)+2(1+q)C]/q$
Γ_3: $k = 1-q^2+Kq$
X-axis: q; Y-axis: k

By Figure 1, it is easy to show that which equilibrium happens depends on the switchers' value. When there are more switchers in the market or their reservation price is higher, we can say the switcher is more valuable. When the switcher is not so valuable, manufacturer wants to set the highest wholesale price H to serve the loyals only, it leads to equilibrium (G^C,0). When the switcher's value is higher but not too high, manufacturers have the incentives to serve all his own consumers but not the rival's switchers, so they can share a retail outlet peacefully and it is the equilibrium (A^C,0). When the switcher's value is too high, if manufacturers choose a common retailer, both of them can not satisfy with serving their own customers only, and it means they will have more intensive price competition. Thus, they are will to have more setup cost to avoid such price competition.

After the emergence of the Internet

After the emergence of the Internet, two things are different from before. First, manufacturers can sell products through the Internet channel where retailers have much less influence on consumers' preference than in the traditional channel. Second, as mentioned in the model, not all consumers can access the Internet and thus the proportions of the Internet users in the segment of loyals (denoted by α_G) and in the segment of switchers (denoted by α_B) would determine the structure of the consumer market and hence the manufacturer's optimal channel strategy. The following lemma shows that manufacturers will choose common dealing whenever they sell products on the Net.

The problems facing each manufacturer include whether to sell his product through the traditional channel, the Internet channel or both, for each distribution channel whether to choose the common dealing or exclusive dealing, and whether to serve his loyals only or switchers as well. There are eight possible symmetric pure strategy equilibriums when manufacturers can distribute their products either through the traditional channel or the Internet channel. We describe them in the following.

1. *Equilibrium (G^C,0):* both manufacturers only serve the loyals in the traditional channel through common dealing ($N_1 \to (G_1,0)$；$N_2 \to (G_2,0)$).

2. *Equilibrium (A^C,0):* both manufacturers serve all consumers in the traditional channel through common dealing ($N_1 \to (G_1+B_1,0)$；$N_2 \to (G_2+B_2,0)$).

3. *Equilibrium (A^E,0):* both manufacturers serve all consumers in the traditional channel through exclusive dealing ($N_1 \to (G_1+B_1,0)$；$N_2 \to (G_2+B_2,0)$).

4. *Equilibrium (0, G^C):* both manufacturers only serve their loyals on the Internet through common dealing.

In the above equilibrium, manufacturers set the wholesale prices at the loyals' reservation price H and so

do retailers set the retail prices. The profits of manufacturers are $\pi_1^M = \pi_2^M = (1-q)\alpha_L H/2 - K_E/2$.

5. *Equilibrium (0, A^C):* both manufacturers serve all consumers on the Internet through common dealing

Because the retail market on the Internet is competitive, retailers can not charge any price higher than their marginal cost, i.e., the wholesale price charged by the manufacturers. As a result, the manufacturer can serve all consumers who can access the Internet in his protected market by setting his wholesale price at the switchers' reservation price M. The profits of manufacturers equal

$$\pi_1^M = \pi_2^M = [(1-q)\alpha_L + q\alpha_S]M/2 - K_E/2.$$

6. *Equilibrium (G^C, A^C):* both manufacturers sell their products through the two distribution channels under common dealing. The manufacturers induce all their customers who can access the Internet to buy their products on the Net and serve their loyals who can not access the Internet in the traditional channel.

In equilibrium (G^C, A^C), each manufacturer would like to serve his switchers on the Net and thus sets his wholesale price at M. Given this wholesale price, the online retailer would set the retail price also at M (again because of competition) while the traditional common retailer would set the retail price at H. Facing the two different retail prices, all consumers who can access the Internet would buy their preferred brand on the Net by paying a cheaper price and only the loyals who can not access the Internet buy their preferred brand from the traditional retailer. The manufacturer's profits are

$$\pi_1^M = \pi_2^M = [(1-q) + q\alpha_S]M/2 - (K_T + K_E)/2.$$

7. *Equilibrium (A^C, A^C):* both manufacturers sell their products through the two distribution channels under common dealing. The manufacturers induce all their customers who can access the Internet to buy their products on the Net and serve their remaining customers in the traditional channel.

When the consumers who can access the Internet are induced to the Net, the structure of remaining consumers in the traditional channel would change. To serve all consumers that stay in the traditional channel, the manufacturers would set their wholesale prices at $M - (1-q)(1-\alpha_G)(H-M)/q(1-\alpha_B)$ to ensure the common retailer the same profits as those when serving the loyals only. This wholesale price is positively related to α_G and negatively related to α_B. With the similar reasoning used in deriving (2-1), we can derive the following lower bound for the retailer's persuading costs in order to sustain the equilibrium:

$$C \geq \frac{q^2(1-\alpha_B)^2 M - q(1-q)(1-\alpha_B)(1-\alpha_G)(H-M)}{2(1-q)(1-\alpha_G) + 4q(1-\alpha_B)} \qquad (3\text{-}2)$$

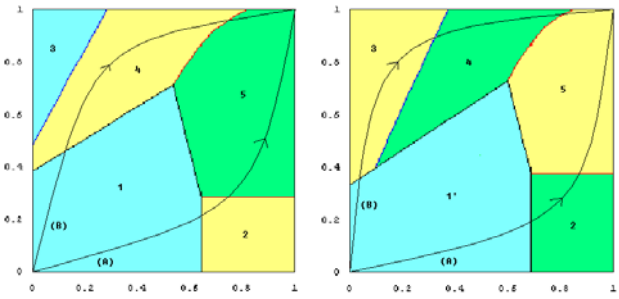
8. *Equilibrium (A^E, A^C):* serve all consumers ..... common dealing on the Internet and with exclusive dealing in the traditional channel.

If (3-2) is not satisfied, it means that when manufacturers adopt the strategy $S(A^C,A^C)$, they would have incentives to attract the competitor's switchers through the retailer's persuading, thus breaking the equilibrium (A^C, A^C). When the proportion of the loyals who can access the Internet is higher than that of the switchers, inducing all Internet users to buy on the Net would lead the proportion of the switchers in the traditional channel relative to that of the loyals increases. Therefore, if manufacturers choose $S(A^C,A^C)$, manufacturers would compete aggressively on their wholesale prices with the hope that the common retailer can attract their rival's switchers for them. To avoid such competition, manufacturers may choose exclusive dealing in the traditional channel, resulting in the equilibrium (A^E, A^C).

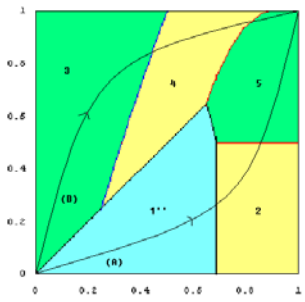
Proposition 2: Let the reservation price of the loyals be 1 and that of the switchers' be k ($0 \leqq k \leqq 1$). Suppose that the setup cost in the traditional channel is the same as that in the Internet channel, i.e., $K_T = K_E = K$. After the emergence of Internet, the conditions for equilibrium (G^C,0) to occur are as follows:[2]

Follow the same logic as in proposition 1. When a equilibrium is sustained, the profits derived from other strategies are always less than the equilibrium profits. Take equilibrium (G^C,0) as an example. A manufacturer has five possible alternative strategies. One is to serve all consumers in the traditional channel; two is to serve the loyals on the net; three is to serve all consumers on the net; four is to serve the loyals in the traditional channel and all consumers on the net; five is to serve all consumers in both channel. Compare the equilibrium profits with others derived from these strategies, and then we can get the inequalities stated in proposition 2.

$$1-q \leq k \leq 1-q^2 \qquad k \geq 1-q^2 \;\&\; k \leq [q(1-q)+2(1+q)C]/q$$



[2] Because of the page limitation, we do not list these conditions here.



$k \geq 1-q^2+Kq;$

$k \geq [q(1-q)+2(1+q)C]/q$

Figure 2 The equilibrium after the emergence of the Internet

Note:
1. Equilibrium: 1: (G^C,0); 1': (A^C,0); 1'': (A^E,0); 2: (G^C,A^C); 3: (A^E,A^C); 4: (A^C,A^C); 5: (0,A^C)
2. X-axis: α_B ; Y-axis: α_G
3. Path A: more switchers can access the Internet than the loyals;
Path B: more loyals can access the Internet than the switchers
4. Parameter value: k=0.35, 0.4, 0.8 (from left to right); q=0.8; C=0.05; K=0.05

Corollary 2-1: Keep the preferences and proportions of the loyals and the switchers constant. Suppose that the proportion of consumers who are able to access the Internet increases over time. Then the manufacturers' equilibrium distribution strategy will be dynamically adapted to the proportions of Internet loyals and Internet switchers.

Keeping other parameters constant, figure 2 shows that how the manufacturers' equilibrium distribution strategy varies with α_G and α_B. Before the emergence of the Internet (or equivalently, when both α_G and α_B equal zero), depending on the importance of switchers (represented by the size of k) and the retailer's persuasion cost, the equilibrium could be (G^C,0), (A^C,0) or (A^E,0), which correspond to equilibrium 1, equilibrium 1' and equilibrium 1'' in the three graphs, respectively. With the increase in the proportion of Internet users, the equilibrium distribution strategy will be dynamically adjusted. The way in which the equilibrium distribution strategy adjusted crucially depends on the relative sizes of α_G and α_B. Two cases can be distinguished: the case where $\alpha_G \leqq \alpha_B$, and the case where $\alpha_G \geqq \alpha_B$.

In the case where $\alpha_G \leqq \alpha_B$, as shown by the path A in figure 2, with the emergence of the Internet, the distribution equilibrium may change from equilibrium (A^E, 0) into (G^C,A^C) as long as α_B is high enough relative to α_G. The manufacturer by expanding into the Internet channel, can induce a relatively higher proportion of switchers to buy his product on the Net, which enables him to serve only the loyal non-Internet users in the traditional channel and thus do not need worry about the traditional retailer's incentive problem of switching his customers. When α_B is high enough relative to α_G, the benefit from alleviating the retailer's incentive problem will outweigh the loss of the non-Internet users in the segment of switchers, thus leading to the equilibrium (G^C,A^C) . As more and more consumers can access the Internet, (0,A^C) becomes the equilibrium strategy.

In the case where $\alpha_G \geqq \alpha_B$, as shown by the path B in figure 2, with the emergence of the Internet and the increase in the proportion of the Internet users, the distribution equilibrium may change from equilibrium (A^C, 0) first into (A^E, A^C), and finally into (A^C,A^C) as long as α_B is high enough relative to α_G. The manufacturer by expanding into the Internet channel, can induce a relatively higher proportion of loyals to buy his product on the Net, which aggravates the retailer's incentive problem of stealing customers but mitigating the manufacturer's concern for double-marginalization. The latter benefit will outweigh the former cost when α_B is small enough relative to α_G, thus resulting in the equilibrium (A^E, A^C). In other words, the manufacturer uses exclusive dealing to overcome the traditional retailer's incentive problem and alleviate the double-marginalization problem by mitigating loyals to the Internet channel. When the proportion of Internet users in the segment of switchers keeps increasing, it becomes less desirable for either manufacturer to induce the retailer to persuade customers and hence the equilibrium changes into (A^C,A^C). As more and more consumers can access the Internet, (0,A^C) becomes the limiting equilibrium.

Corollary 2-2: Whether common dealing becomes more prevalent after the emergence of the Internet crucially depends on the structure of the consumer market, in particular, the importance of loyal switchers, and the proportions of Internet users in the segment of loyals and in that of switchers (α_G and α_B).

1. If $k \geq 1-q^2+Kq$ and $k \geq [q(1-q)+2(1+q)C]/q$, common dealing becomes more prevalent in the presence of the Internet channel;

2. If $1-q \leq k \leq 1-q^2$ or $1-q^2 \leq k \leq [q(1-q)+2(1+q)C]/q$, exclusive becomes more prevalent only if α_G is extremely high relative to α_B;

3. If $k \leq 1-q$, manufacturers prefer common

dealing to exclusive dealing both in the absence and in the presence of the Internet channel.

Proof. The above corollary is derived by comparing the equilibria before the emergence of the Internet channel with those after.

References

[1] Bakos, Yannis J. (1997),"Reducing Buyer Search Costs: Implications for Electronic Marketplaces, " *Management Science*, Vol. 43, No. 12, pp. 1676-1692.

[2] Brynjolfsson and Michael D. Smith (2000) ,"Frictionless Commerce? A Comparison of Internet and Conventional Retailers, " *Management Science*, Vol. 46, No. 4 (April), pp. 563-585.

[3] Lal, Rajiv and Miklos Savary (1999),"When and How is the Internet Likely to Decrease Price Competition, " *Marketing Science*, Vol. 18, No. 4, pp.485-503.

[4] Lin, Y. J. (1990)," The Dampening-of-Competition Effect of Exclusive Dealing, "*Journal of Industrial Economics*, 39, pp.209-223.

[5] Marvel, Howard P. (1982),"Exclusive Dealing, " *Journal of Low and Economics*, Vol. XXV (April), pp. 1-25.

[6] Mathewson, G Frank and Ralph A. Winter (1987), "The Competitive Effects of Vertical Agreements: Comment," The American Economic Review, pp. 1057-1062.

[7] Narasimhan, Chakravarthi (1988), "Competitive promotional strategies, " *The Journal of Business*, Vol. 61, Iss. 4, pp. 427-49.

[8] O'Brien, Daniel P. and Greg Shaffer (1993),"On the Dampening-of-Competition Effect of Exclusive Dealing, " *The Journal of Industrial Economics*, Vol. XLI (June), pp. 215-221.

[9] Varian, Hal R. (1980),"A model of sales, " *The American Economic Review*, Vol. 70, Iss. 4; pg. 651